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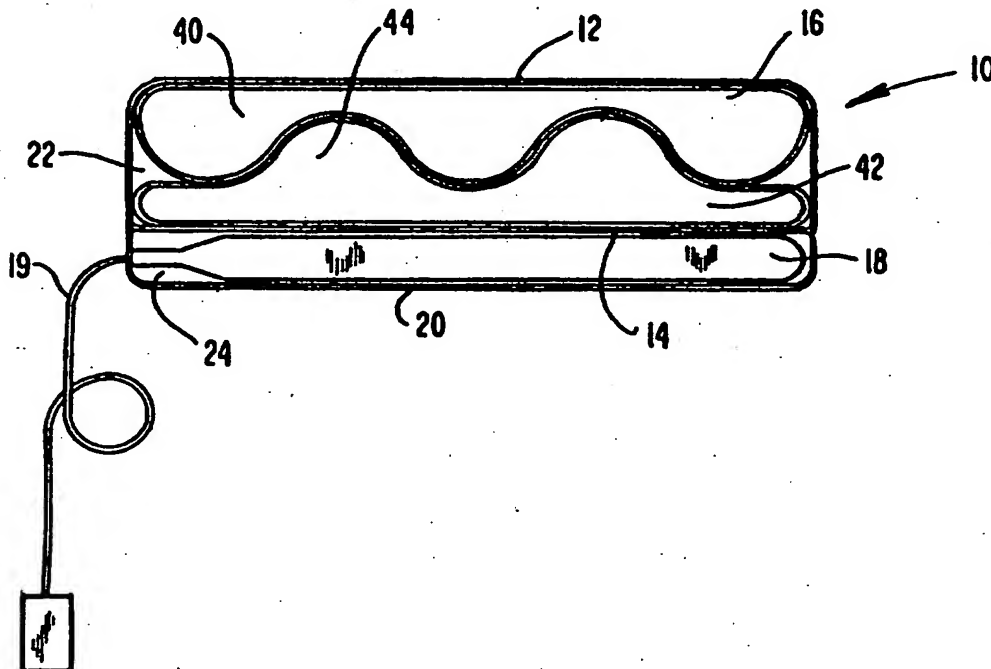
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(54) Title: INFANT MATTRESS ASSEMBLY

(57) Abstract

An infant mattress assembly which is X-ray transparent, so that an X-ray cassette can be positioned beneath the infant mattress assembly and X-ray images can be taken of an infant placed on the infant mattress assembly. The infant mattress assembly includes a mattress (10) having a top surface (12) upon which an infant can be placed, a bottom surface (14) spaced from the top surface, and an X-ray transparent cushion (16) between the top surface (12) of the mattress (10) and the bottom surface (14) of the mattress (10). This infant mattress assembly also includes an X-ray transparent film heater unit (18) beneath the bottom surface (14) of the mattress (10) and in heat transfer disposition with the X-ray transparent cushion (16).



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INFANT MATTRESS ASSEMBLY

TECHNICAL FIELD

5 The present invention relates, in general, to the treatment of infants and, in particular, to a mattress assembly having a heated mattress which provides warmth to an infant placed upon the mattress.

BACKGROUND OF THE INVENTION

10 Infant incubators, body warmers, phototherapy units and other equipment are used in the treatment and maintenance of weak, sickly, premature and low birth weight infants. Often, it is desirable to provide additional heat to the infant, beyond the heat which is available from the particular piece of equipment being employed in the treatment and
15 maintenance of the infant.

Typically, such equipment has a mattress upon which the infant is placed. In the past, certain of these mattresses have been arranged with resistance wire heaters and heated water containers.

20 It is often necessary to take X-ray images of an infant being treated, for example, in an incubator. In order to avoid disturbing the infant or sensors and instrumentation attached to the infant when an X-ray cassette is inserted directly under the body of the infant, the X-ray cassette
25 preferably is positioned beneath the support upon which the mattress is placed and which can be lifted by a lift mechanism which is provided in most incubators. This requires that the components, namely the mattress support, the heater, and the mattress be X-ray transparent.

30 Resistance wire heaters are undesirable because they are not X-ray transparent and effectively preclude taking

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X-ray images as described above. Heated water containers are cumbersome and awkward to handle.

SUMMARY OF THE INVENTION

Accordingly, an infant mattress assembly,
5 constructed in accordance with the present invention, includes
a mattress having a top surface upon which an infant can be
placed, a bottom surface spaced from the top surface, and an
X-ray transparent cushion between the top surface and the
bottom surface. This infant mattress assembly also includes
10 an X-ray transparent film heater unit beneath the bottom
surface of the mattress and in heat transfer disposition with
the cushion.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a sectional view of a first embodiment
15 of an infant mattress assembly constructed in accordance with
the present invention.

Figure 2 is a sectional view of the X-ray
transparent film heater unit of the Figure 1 infant mattress
assembly.

20 Figure 3 is a sectional view of a second embodiment
of an infant mattress assembly constructed in accordance with
the present invention.

Figure 4 is a sectional view of the X-ray
transparent film heater unit and its housing of the Figure 3
25 infant mattress assembly.

Figure 5 is a perspective view of a third embodiment
of an infant mattress assembly constructed in accordance with
the present invention.

30 Figure 6 is a side view, partially in section, which
shows the relative positions of an infant mattress assembly,

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constructed in accordance with the present invention, a mattress assembly support and an X-ray cassette or a phototherapy unit.

DETAILED DESCRIPTION OF THE INVENTION

5 Referring to Figure 1, an infant mattress assembly, constructed in accordance with the present invention, includes a mattress 10 having a top surface 12 upon which an infant can be placed, a bottom surface 14 spaced from said top surface, and an X-ray transparent cushion 16 between top surface 12 and
10 bottom surface 14. Also included in this infant mattress assembly is an X-ray transparent film heater unit 18 beneath bottom surface 14 of mattress 10 and in heat transfer disposition with X-ray transparent cushion 16. X-ray transparent film heater unit 18
15 is powered through a line cord 19.

The Figure 1 embodiment of the present invention also includes a mattress cover 20 which has an upper compartment 22 which defines top surface 12 of mattress 10 and bottom surface 14 of the mattress and within which X-ray
20 transparent cushion 16 is positioned. Mattress cover 20 also has a lower compartment 24 within which X-ray transparent film heater unit 18 is positioned. With X-ray transparent film heater unit 18 so positioned and being flexible, it conforms to the contour of the common wall between upper compartment 22
25 and lower compartment 24 of mattress cover 20. X-ray transparent film heater unit 18 serves as a heat source from which heat is conducted through mattress 10 to an infant placed on the mattress.

The Figure 3 embodiment of the present invention
30 includes a mattress cover 26 which defines top surface 28 of mattress 30 and bottom surface 32 of the mattress and within which X-ray transparent cushion 34 is positioned and a heater housing 36 within which an X-ray transparent film heater unit is positioned. The X-ray transparent film heater unit is
35 powered through a line cord 39.

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Preferably, X-ray transparent cushion 16 of the Figure 1 embodiment of the present invention and X-ray transparent cushion 34 of the Figure 3 embodiment of the present invention are conventional bubble-pack material arranged in two layers 40 and 42 with the fluid-filled chambers 44 of one layer fitted into spaces between the fluid-filled chambers of the other layer. Preferably, the fluid in the bubble-pack material is clean air.

As shown in Figure 2, which is a sectional view of X-ray transparent film heater unit 18 of the Figure 1 infant mattress assembly, the X-ray transparent film heater unit can be composed of a laminate of a conductive material and a dielectric substrate. For example, the X-ray transparent film heater can be an indium tin oxide/PET laminate 46 disposed between a pair of thick films 48 and 50 made from, for example, PVC, PVDC or PET, with the indium tin oxide/PET laminate adhesively bonded to upper thick film 48. X-ray transparent film heater unit 38 of the Figures 3 and 4 embodiment of the present invention can be arranged the same way in heater housing 36.

As shown in Figure 4, which is a sectional view of the X-ray transparent film heater unit and its housing of the Figure 3 infant mattress assembly embodiment of the present invention, housing 36 is composed of an upper panel 33, a lower panel 35 and a perimeter seal 37. Also included within heater housing 36 are means for urging X-ray transparent film heater unit 38 upward toward X-ray transparent cushion 34. As shown in Figure 4, such means preferably include bubble-pack material 50. With transparent film heater unit 38 so positioned, it serves as a heat source from which heat is conducted through upper panel 33 of housing 36 and mattress 30 to an infant placed on the mattress. While in the Figure 1 embodiment the X-ray transparent film heater is flexible, in the Figure 3 embodiment the X-ray transparent film heater can be rigid because it is contained within a rigid housing.

Referring to Figure 5, which is a perspective view of a third embodiment of the present invention, X-ray transparent film heater unit 52 of the mattress assembly, powered through a line cord 53, can be arranged to extend beyond the lateral edges 54 and 56 extending along the length of mattress 58 and between top surface 60 of the mattress and bottom surface 62 of the mattress. For this arrangement, heater housing 64 and X-ray transparent film heater unit 52 within the heater housing can be generally similar to heater housing 36 and X-ray transparent film heater unit 38 of the Figures 3 and 4 embodiment of the present invention, except that in the Figure 5 embodiment the heater housing and the X-ray transparent film heater unit are flexible and are sized to extend beyond lateral edges 54 and 56 of mattress 58 to form a tunnel which surrounds an infant placed on the mattress. Suitable means, for example a zipper 66, for fastening together the lateral edges of heater housing 64, are provided at the lateral edges of the heater housing.

In the Figure 5 embodiment of the present invention, X-ray transparent film heater unit 52 serves not only as a heat source from which heat is conducted to the infant through mattress 58 but also as a source of radiant heat as represented by arrows 68. The "eye" 70 represents optical transparency of heater housing 64 and X-ray transparent film heater unit 52.

U.S. 5,119,467 is directed to a transparent film radiant heat source for use with infant incubators and discloses a number of constructions of a transparent film heater which can serve as the X-ray transparent film heater unit 18 of the Figures 1 and 2 embodiment of the present invention, the X-ray transparent film heater unit 38 of the Figures 3 and 4 embodiment of the present invention, and the X-ray transparent film heater unit 52 of the Figure 5 embodiment of the present invention. Accordingly, U.S. 5,119,467 is incorporated by reference herein as if its full contents were set forth herein.

Referring to Figure 6, an infant mattress assembly, constructed in accordance with any of the embodiments of the present invention which have been described and including a mattress/X-ray transparent film heater unit 72, can be positioned on a mattress assembly support 76 with an X-ray cassette, represented by reference numeral 78, positioned beneath the mattress assembly support. Mattress support 76 can have an opening 80 as shown in Figure 6, provided the housing of the X-ray transparent film heater unit is rigid (e.g. Figure 3) and can support the mattress and the infant placed on the mattress or can be solid throughout its length, provided the mattress support is X-ray transparent, in which case the mattress support provides support for the mattress and the infant placed on the mattress and the housing of the X-ray transparent film heater unit can be flexible (e.g. Figures 1 and 5).

As indicated above, it is often necessary to take X-ray images of an infant being treated in an incubator, radiant warmer, or the like. In order to avoid disturbing the infant or sensors and instrumentation attached to the infant when an X-ray cassette is inserted directly under the body of the infant, the X-ray cassette preferably is positioned beneath the mattress support upon which the infant is placed which can be lifted by a lift mechanism built into the unit in which the infant is being treated. This requires that the components (i.e. mattress support, heater unit, and mattress) be X-ray transparent. A X-ray transparent film heater, a bubble-pack layer and an X-ray transparent mattress support or a mattress support having an opening satisfy this requirement.

Although a number of materials can be used as the mattress cushion, bubble-pack material is particularly beneficial. As compared to closed-cell foam, which is a common mattress material, bubble-pack material has superior heating and heat transfer characteristics. Bubble-pack material heats up much more quickly than does closed-cell foam and the heat loss in bubble-pack material is considerably less than in closed-cell foam. As compared to reticulated foam,

bubble-pack material is considerably less expensive and X-ray artifacts are negligible.

5 It should be noted that, with the mattress and transparent film heater made from the materials described above, a removable phototherapy light source, also represented by reference numeral 78 in Figure 6, can be introduced beneath the mattress support because these materials also are transparent to visible light and the frequencies used in phototherapy.

10 While in the foregoing there have been described preferred embodiments of the present invention, it should be understood by those skilled in the art that various modifications and changes can be made without departing from the true spirit and scope of the present invention.

What is Claimed:

- 1 1. An infant mattress assembly comprising:
 - 2 a mattress having:
 - 3 (a) a top surface upon which an infant can be
 - 4 placed,
 - 5 (b) a bottom surface spaced from said top surface,
 - 6 and
 - 7 (c) an X-ray transparent cushion between said top
 - 8 surface and said bottom surface;
 - 9 and an X-ray transparent film heater unit beneath
 - 10 said bottom surface of said mattress and in heat transfer
 - 11 disposition with said X-ray transparent cushion.
- 1 2. An infant mattress assembly according to claim
- 2 1 wherein said X-ray transparent cushion is bubble-pack
- 3 material.
- 1 3. An infant mattress assembly according to claim
- 2 1 wherein said X-ray transparent cushion is two layers of
- 3 bubble-pack material, each layer having a plurality of fluid-
- 4 filled chambers with the chambers of one layer fitted into
- 5 spaces between the chambers of the other layer.
- 1 4. An infant mattress assembly according to claim
- 2 1 further including a mattress cover having:
 - 3 (a) an upper compartment defining said top surface
 - 4 of said mattress and said bottom surface of said
 - 5 mattress and within which said X-ray transparent
 - 6 cushion is positioned, and
 - 7 (b) a lower compartment within which said X-ray
 - 8 transparent film heater unit is positioned.

1 5. An infant mattress assembly according to claim
2 4 wherein said X-ray transparent cushion is bubble-pack
3 material.

1 6. An infant mattress assembly according to claim
2 4 wherein said X-ray transparent cushion is two layers of
3 bubble-pack material, each layer having a plurality of
4 fluid-filled chambers with the chambers of one layer fitted
5 into spaces between the chambers of the other layer.

1 7. An infant mattress assembly according to claim
2 1 further including:

3 (a) a mattress cover defining said top surface of
4 said mattress and said bottom surface of said
5 mattress and within which said X-ray transparent
6 cushion is positioned, and

7 (b) a heater housing within which said X-ray
8 transparent film heater unit is positioned.

1 8. An infant mattress assembly according to claim
2 7 wherein said X-ray transparent cushion is bubble-pack
3 material.

1 9. An infant mattress assembly according to claim
2 7 wherein said X-ray transparent cushion is two layers of
3 bubble-pack material, each layer having a plurality of
4 fluid-filled chambers with the chambers of one layer fitted
5 into spaces between the chambers of the other layer.

1 10. An infant mattress assembly according to claim
2 1 wherein:

3 (a) said mattress has lateral edges extending along
4 the length thereof and between said top surface of
5 said mattress and said bottom surface of said
6 mattress, and

7 (b) said X-ray transparent film heater unit extends
8 beyond said lateral edges of said mattress.

1 11. An infant mattress assembly according to claim
2 10 wherein said X-ray transparent cushion is bubble-pack
3 material.

1 12. An infant mattress assembly according to claim
2 10 wherein said X-ray transparent cushion is two layers of
3 bubble-pack material, each layer having a plurality of
4 fluid-filled chambers with the chambers of one layer fitted
5 into spaces between the chambers of the other layer.

1 13. An infant mattress assembly according to claim
2 7 further including means within said heater housing for
3 urging said X-ray transparent film heater unit upward toward
4 said X-ray transparent cushion.

1 14. An infant mattress assembly according to claim
2 13 wherein said urging means include bubble-pack material.

1 15. An infant mattress assembly according to claim
2 10 further including:

3 (a) a mattress cover defining said top surface of
4 said mattress and said bottom surface of said
5 mattress and within which said X-ray transparent
6 cushion is positioned, and

7 (b) a heater housing within which said X-ray
8 transparent film heater unit is positioned.

1 16. An infant mattress assembly according to claim
2 15 wherein said heater housing and said X-ray transparent film
3 heater unit are flexible.

1 17. An infant mattress assembly according to claim
2 16 wherein said heater housing and said X-ray transparent film

heater unit are sized to extend beyond said lateral edges of said mattress to surround an infant placed on said mattress.

18. An infant mattress assembly according to claim 17 wherein said heater housing has lateral edges extending along the length thereof and said infant mattress assembly further includes means for fastening said lateral edges of said heater housing together.

19. An infant mattress assembly according to claim 7 wherein said heater housing is rigid.

20. An infant mattress assembly according to claim 19 further including means within said heater housing for urging said X-ray transparent film heater unit upward toward said X-ray transparent cushion.

21. An infant mattress assembly according to claim 20 wherein said urging means include bubble-pack material.

22. An infant mattress assembly according to claim 1 wherein said X-ray transparent film heater unit includes a laminate of a conductive material and a dielectric substrate.

23. An infant mattress assembly according to claim 4 wherein said X-ray transparent film heater unit includes a laminate of a conductive material and a dielectric substrate.

24. An infant mattress assembly according to claim 7 wherein said X-ray transparent film heater unit includes a laminate of a conductive material and a dielectric substrate.

25. An infant mattress assembly according to claim 10 wherein said X-ray transparent film heater unit includes a laminate of a conductive material and a dielectric substrate.

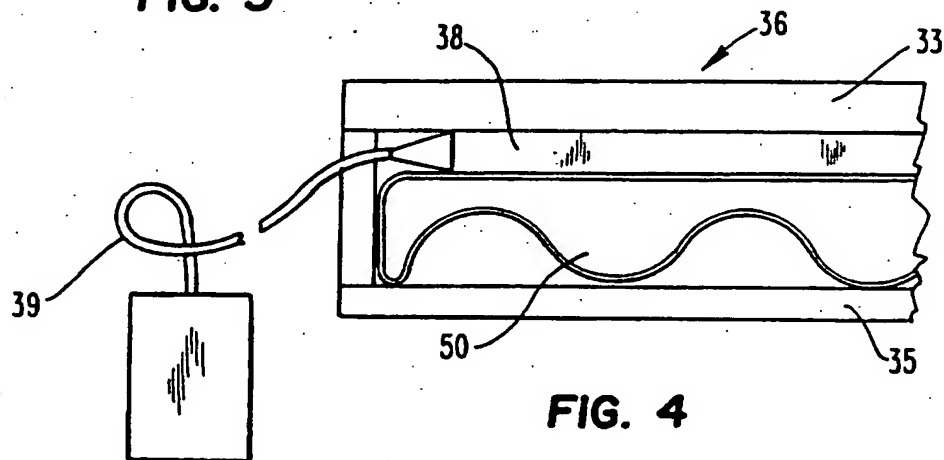
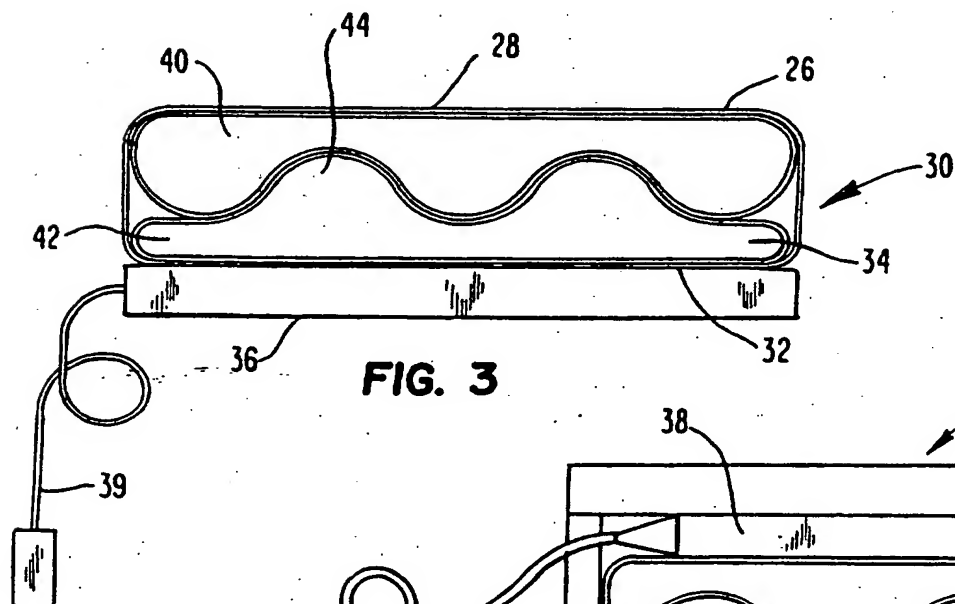
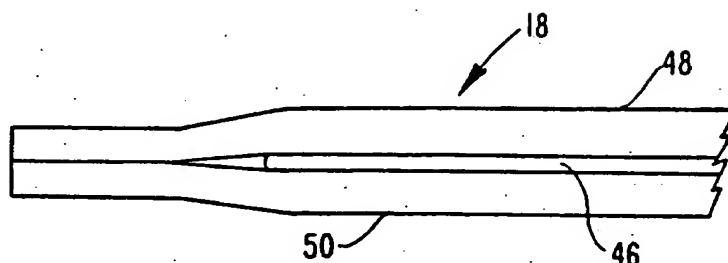
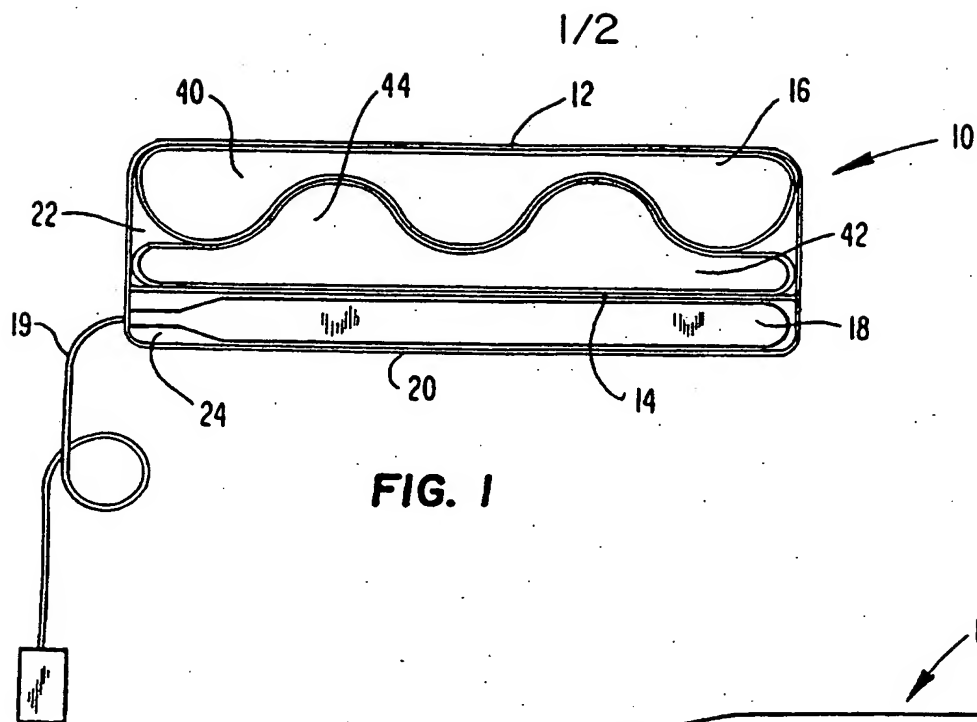
-12-

1 26. An infant mattress assembly according to claim
2 15 wherein said X-ray transparent film heater unit includes a
3 laminate of a conductive material and a dielectric substrate.

1 27. An infant mattress assembly according to claim
2 22 wherein said laminate is flexible.

1 28. An infant mattress assembly according to claim
2 23 wherein said laminate is flexible.

1 29. An infant mattress assembly according to claim
2 25 wherein said laminate is flexible.



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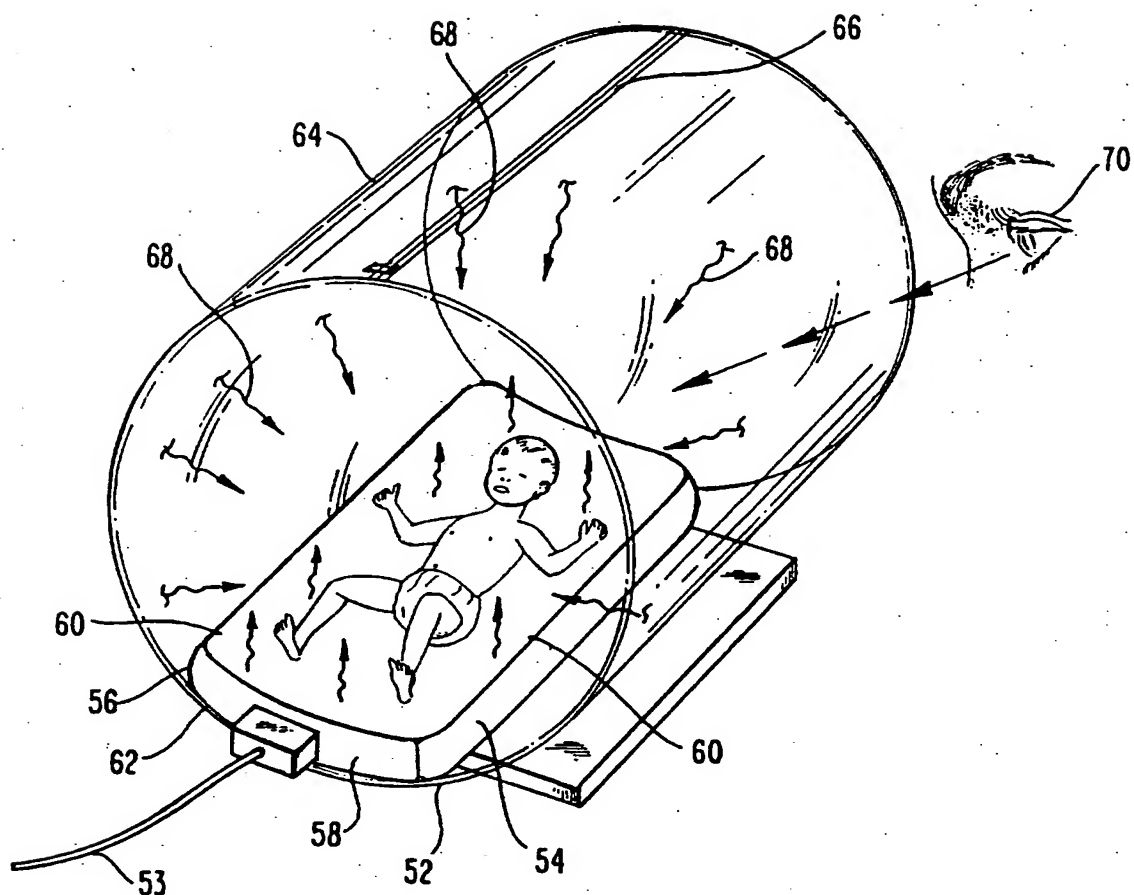


FIG. 5

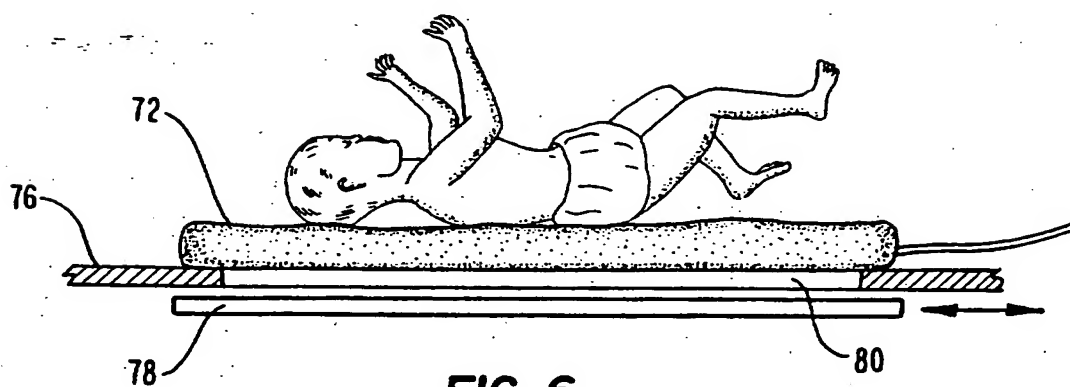


FIG. 6

SUBSTITUTE SHEET (RULE 26)

INTERNATIONAL SEARCH REPORT

Intern al Application No

PCT/US 95/11507

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 A61B6/04 A47C21/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 A61B A47C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	FR,A,1 487 809 (USINES REY & TRAMBLAY) 29 April 1967 see page 1, left column, line 1 - line 31 see page 1, right column, line 44 - page 2, left column, line 14 see page 3, left column, line 28 - line 53 ---	1
A	FR,A,1 002 206 (W. WEBER) 4 March 1952 see the whole document ---	1
A	EP,A,0 325 850 (HILL-ROM COMPANY INC.) 2 August 1989 see abstract; claims; figures 4-9 ---	1
A	DE,U,82 28 688 (RICHARD WOLF GMBH) 9 December 1982 see claims 1,5; figures -----	1

☐ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
FR-A-1487809	19-10-67	NONE	
FR-A-1002206	07-03-52	NONE	
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		CA-A- 1285103	25-06-91
		DE-A- 3868502	26-03-92
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DE-U-8228688		NONE	

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